WE CLAIM:

1. A fiber laser, comprising:

A gain fiber less than 5cm in length including,

A cladding formed from an oxide-based multi-component glass selected from phosphate, germanate, or tellurite; and

A core formed from the same glass doped with 0.5-30 wt. % ytterbium oxide;

A narrowband grating at one end of the fiber;

A broadband grating at the other end of the fiber; and

A source of pump radiation that illuminates the fiber so that the ytterbium oxide ions lase at a single longitudinal mode and said fiber outputs a single-mode signal having a center wavelength between approximately 0.98 μm and 1.08 μm with a linewidth less than 10 kHz.

2. The fiber laser of claim 1, wherein the glass is doped with 3-20 wt. % ytterbium oxide.

3. The fiber laser of claim 1, wherein the glass is doped with 6-15 wt. % ytterbium oxide.

4. The fiber laser of claim 1, wherein the narrowband and broadband gratings are formed in sections of passive silica fiber that are fusion spliced to the ends of the gain fiber.

5. The fiber laser of claim 1, wherein the pump includes a section of polarization maintaining fiber.

6. The fiber laser of claim 1, wherein the multi-component glass includes the following ingredients by weight percentages,

a network former of 30 to 80 percent, where the network former is selected from phosphate-oxide P_2O_5, germanate-oxide GeO_2 or tellurite-oxide TeO_2,

L_2O_3 of at least 10 percent, where L_2O_3 is selected from Al_2O_3, B_2O_3, Y_2O_3, La_2O_3, and mixtures thereof, and

MO of at least 5 percent, where MO is selected from BaO, BeO, MgO, SrO, CaO, ZnO, PbO and mixtures thereof.

7. The fiber laser of claim 6, wherein the glass includes by weight percentages,

55 to 65 percent phosphate-oxide P_2O_5,

3 to 5 percent Al_2O_3,

0.75 to 1.5 percent B_2O_3,

24 to 28 percent BaO, and

0.75 to 1.5 percent ZnO.

8. The fiber laser of claim 1, wherein the gain fiber is less than 3cm in length.

9. The fiber laser of claim 1, wherein the gain fiber is a polarization maintaining (PM) fiber.

10. The fiber laser of claim 9, wherein the polarization whose stimulated emission cross section of the gain fiber is higher is aligned to the orientation of the operating polarization of the narrow-band fiber Bragg grating.

11. The fiber laser of claim 1, wherein the narrowband grating has a linewidth less than 0.07 nm and the broadband grating has a linewidth between 0.07 nm and 0.4 nm.

12. The fiber laser of claim 1, wherein the single-mode signal has greater than 2 mW of output power.

13. The fiber laser of claim 1, wherein the single-mode signal has greater than 20 mW of output power.

14. A fiber laser, comprising:

A gain fiber less than 5cm in length including,

A cladding formed from an oxide-based multi-component glass selected from phosphate, germanate, or tellurite; and

A single mode core formed from the same glass doped with 0.5-30% ytterbium oxide;

A passive silica fiber having a narrowband grating formed therein and fused at one end of the gain fiber;

A passive silica fiber having a broadband grating formed therein and fused at the other end of the gain fiber; and

A source of pump radiation that illuminates the fiber so that the ytterbium oxide ions lase at a single longitudinal mode and said fiber outputs a single-mode signal having a center wavelength at approximately 1 μm.

15. The fiber laser of claim 14, wherein the glass is doped with 6-15 wt. % ytterbium oxide.

16. The fiber laser of claim 14, wherein the glass includes

by weight percentages,

55 to 65 percent phosphate-oxide P_2O_5,

3 to 5 percent Al_2O_3,

0.75 to 1.5 percent B_2O_3,

24 to 28 percent BaO, and

0.75 to 1.5 percent ZnO.

17. The fiber laser of claim 14, wherein the gain fiber is less than 3cm in length.

18. The fiber laser of claim 14, wherein the single-mode signal has a linewidth of less than 10 kHz.

19. A fiber laser, comprising:

A gain fiber less than 5cm in length including,

A cladding formed from an oxide-based multi-component glass including 55 to 65 weight percent phosphate-oxide P_2O_5, 3 to 5 weight percent Al_2O_3, 0.75 to 1.5 percent B_2O_3, 24 to 28 weight percent BaO, and 0.75 to 1.5 weight percent ZnO; and

A core formed from the same glass doped with 3-20 weight percent ytterbium oxide;

A narrowband grating at one end of the fiber;

A broadband grating at the other end of the fiber; and

A source of pump radiation that illuminates the fiber so that the ytterbium oxide ions lase at a single longitudinal mode and said fiber outputs a single-mode signal having a center wavelength at approximately 1 μm.

20. The fiber laser of claim 19, wherein the narrowband and broadband gratings are formed in sections of passive silica

fiber that are fusion spliced to the ends of the gain fiber.

21. The fiber laser of claim 19, wherein the single-mode signal has a linewidth of less than 10 kHz.